

Medical Aspects of Adolescents Participating in Sports

SAMUEL HURWITZ, MD, *San Francisco*

AS A RESULT of an increase in various hormone levels in adolescence, there occurs a rapid and extensive growth in height, weight, muscle mass and sexual maturity. These changes bring new and greater nutritional requirements. The need for protein, iron, calcium and calories is particularly high. Normal adolescents differ greatly in the timing, rate and extent of their growth. Therefore, chronological age is a deceptive yardstick in planning a physical program for adolescents.

Other features of this age period are identity problems, acting out and impulsive behavior. In some instances goals which seem unattainable are denied by the adolescent (for instance, a boy may say that he doesn't want to be on the team). He may become self-scoring and self-belittling because of unrealistically high aspirations for himself. Fearing criticism or ridicule, he becomes uncommunicative. He may seek to dispel uncertainties regarding courage by acts involving physical hazard. Anger and despair may even lead to suicide (the third most common cause of death in adolescence). Many adolescents are not ready for the intense emotional stress of competition, but all require continued reassurance and genuine interest.

The basic objective should be the same in all physical education programs: to provide the most pleasant physical activity that will help the student attain maximum "fitness" (defined as the ability

to function at one's best level of efficiency in all daily living). Thus physical exercise, in addition to providing an approved outlet for an adolescent's excess energy, may be of great therapeutic value in some social and emotional problems of adolescence.

Some conditions seen in adolescents are also seen in adults, but there also are some that are unique or occur more commonly in adolescence. Furthermore a delayed sequence and extent of bone and muscle development, and weakness inherent in the epiphyseal plate, may lead to more severe complications in adolescents subject to athletic injury. Some of the conditions observed in the teenager are (a) osteochondritis (for instance, Osgood-Schlatter disease) and epiphysitis (juvenile vertebral epiphysitis which may result in kyphosis, "little leaguer's elbow"), (b) slipped femoral epiphyses, (c) osteochondritis ossificans, (d) spondylosis (weak back), (e) "duck neck" (marked weakness of the cervical strap muscles, a condition in which the patient is constantly sustaining cervical sprains), (f) subluxing patella, (g) quadriceps insufficiency, (h) recurrent dislocation, (i) avulsion, (j) tenosynovitis and, a very serious condition, (k) premature epiphyseal closure with resulting undergrowth of the part.

For the health and welfare of the athletes, certain features should be considered essential to a sports program: (1) proper medical supervision and care; (2) adequate conditioning; (3) proper instruction of skills; (4) properly fitted, well-constructed and well-designed equipment; (5)

From the Department of Public Health, City and County of San Francisco, Francis J. Curry, MD, Director.

Reprint requests to: S. Hurwitz, MD, Northeast Health Center, 1490 Mason Street, San Francisco, CA 94133.

proper facilities for competition; (6) application of sound health principles in the care of equipment, as well as of locker rooms, showers and other facilities; (7) competent use of a well-regulated rules code and (8) first aid instruction for prevention and treatment of injuries and for rehabilitation of injured athletes.

Proper Medical Supervision and Care

Ideally an adolescent athlete should have at least one physical examination each year. With any intervening illness, injury or operation, a medical clearance should be required before return to full activity. The physical examination should be done under conditions that enable the physician (a) to determine the health status of the participant, (b) provide medical advice regarding optimum health fitness, (c) restrict the activities of those whose physical limitations present undue risk and assign them to selected programs and (d) suggest means of curtailing injury and improving safety. The student's own private physician is best equipped to do this, and mass examinations are totally unsatisfactory and should not be condoned. The medical workup should include evaluation of past illnesses, injuries and operations. The immunization record is of importance so that the physician will know for what, and when, the individual has received injections. An initial course of three tetanus injections (usually given with diphtheria and whooping cough) in the first year of life, with a booster in the second year and again before entering primary school, will provide protection for at least ten years thereafter. Any severe lacerating injury a year after injection might merit a booster inoculation. Polio immunization should be considered essential since the role of trauma in localizing paralysis has often been cited. In addition, a lasting protection against rubeola, rubella and mumps is available with only one injection of a combined vaccine and will certainly aid in decreasing the absentee incidence for illness in any program. A blood test, urine examination, tuberculin test and, if possible, a chest x-ray study are worthwhile for a complete evaluation. Physiologic exercise testing is of help in evaluating cardiovascular functional capacity, particularly as a means of clearing adolescents for strenuous exercise programs, and to evaluate responses to conditioning programs. Where special apparatus is not available, objective methods (such as noting the heart rate and observing transient fatigue, breathlessness, weakness or other

symptoms) will be useful in regulating training programs.

It is helpful to divide sports into several categories. Baseball, football, basketball, soccer, hockey, lacrosse and wrestling may be classed as contact sports. Non-contact sports may be divided into those requiring endurance (swimming, track and cross-country running, tennis and rowing) and others (such as bowling, archery and golf). This will enable a more intelligent evaluation of conditions for disqualifying participation in any particular sport.

I shall list the medical conditions which should disqualify an athlete from participating in contact sports.

- *Neurologic conditions:* (1) large cranial defects following intracranial surgery (2) inadequacy of the neuromuscular system, congenital or acquired, that is incompatible with the contact or skill the sport demands and (3) a history of three concussions. As regards epilepsy, a statement issued several years ago by the Committee on Sports Medicine of the American Medical Association stated that epileptics should not participate in contact sports. Recently Livingston, of Johns Hopkins Medical School, stated that he has not seen, in over 15,000 cases, any convulsions precipitated by head trauma in epileptics whose seizures were under control (free of seizures for at least one year). Psychologically more harm may be done by restricting participation instead of allowing such an individual to lead as normal and active a life as possible.

- *Eye conditions:* (1) absence of one eye or severe amblyopia of one eye (20/200 corrected), (2) retinal detachment (repaired or unrepaired) and (3) congenital glaucoma.

- *Ear conditions:* deafness or pronounced impairment of hearing which might endanger the individual's welfare.

- *Cardiovascular conditions:* (1) active rheumatic fever and 1 year after carditis has subsided, (2) cardiac enlargement, (3) severe valvular lesions (mitral stenosis, aortic stenosis), (4) previous heart surgery for congenital or acquired disease and (5) hypertension on any organic basis.

- *Pulmonary conditions:* (1) active tuberculosis (not just on isonicotinic acid hydrazide) and (2) emphysema. Asthma per se is not a contraindication but there should be a ready access to medication when necessary.

- *Abdominal conditions:* (1) any enlarged major abdominal organ (spleen, liver, kidney),

(2) absence or pronounced impairment of one of paired organs (kidney, testis and so forth), (3) active kidney infection and (4) inguinal hernia (which should be immediately repaired).

- *Metabolic conditions:* (1) uncontrolled diabetes, (2) hyperthyroidism, (3) hyperparathyroidism and (4) Cushing's syndrome.

- *Hematologic conditions:* (1) bleeding tendency and (2) coagulation defects.

- *Osseous conditions:* (1) active osteochondritis (Osgood-Schlatter disease, which is disabling), (2) slipped femoral epiphyses, (3) chronic osteomyelitis, (4) recurrent dislocation of the shoulder and (5) metabolic bone disease resulting in skeletal weakness. With regard to amputees, if the integrity of the affected limb is medically affirmed and the nature of the sport does not impose undue risk for the amputee, teammates or opponents, participation in contact sports may be allowed.

Conditioning

A year-round program of physical conditioning is advocated for all adolescents, especially those interested in athletics. Each coach will utilize those methods and means to accomplish ends which he considers most desirable, and will construct a program of training and conditioning that will best meet the physical and psychological needs of his squad. There should be a minimum of three to four weeks of practice before the first official game. Practice periods of reasonable duration (about 1½ hour limit) are desirable. Any program should be aimed at maintaining optimum weight level, increasing strength, endurance, flexibility, skill, speed of movement, acclimation, psychological readiness, and the practice of desirable health habits. Self-discipline should be instilled early in the athlete. The adolescent should be encouraged to get eight hours sleep; consume a proper, nutritious diet and avoid smoking, alcoholic beverages and all possible drugs. The use of dietary supplements (such as vitamins, wheat germ and aminoacids) has shown no demonstrable effect in increasing efficiency and is costly and unnecessary. Contrary to the view that a steak meal should be consumed before a game, it would seem to make more sense physiologically to increase the glycogen content of the body, which supplies the energy for the athlete's effort, by a high carbohydrate diet for 24 to 36 hours before strenuous activity.

A resolution adopted by the 1972 House of

Delegates of the American Medical Association calls upon all physicians to exert rigid control over the prescribing of stimulant and sedative drugs, and androgenic anabolic steroids, to athletes. Habituation to amphetamines can lead to problems of insomnia, headache, acute anxiety state and circulatory collapse—without improving performance level. Medication of normal athletes with androgenic substances is without benefit and may cause a disturbance of metabolic processes (such as retention of salt and water, interruption of growth and psychic changes—particularly dangerous in adolescents who have not yet formed and stabilized their personalities as young adults) and, possibly, prostatic cancer.

Aching muscles, joints, and tendons are common in the early stages of exercise and are normally the result of inappropriate conditioning at too rapid a pace. Most musculoskeletal complaints respond rapidly to a reduced pace or temporary discontinuance of the program. Headaches during football practice are not uncommon, and only very rarely indicate neurological or vascular illness which may be aggravated by playing. Frequently such headaches are overcome by attention to proper fitting of the helmet, overall conditioning with particular attention to strengthening the neck muscles, prevention of mild forms of heat exhaustion and correction of defective vision or dental problems. These headaches usually disappear as the athlete gets into better shape. Obese youngsters should be advised about sensible weight reduction and should not attempt too much exercise at the start of a conditioning program. Rapid weight loss by drastic diet or dehydration measures can be harmful and cause cardiovascular difficulties. In unusual environmental conditions (excessive heat and humidity), in times of stress or emotional turmoil or following ingestion of a heavy meal, exercise should be decreased or temporarily abandoned. Furthermore, under climatic conditions of high temperature and humidity, the drinking of water freely during the workout should be encouraged. Ordinarily the extra salting of food will usually be sufficient to prevent serious electrolyte imbalance, but a salt solution (¼ tsp to 1 qt of water) or a commercial product such as Gatorade® can be used. A warm-up period of three to five minutes before active participation in a game and, possibly, a tapering off period after strenuous activity should be recommended. Excessively hot showers are to be avoided immediately after exercise as in rare instances they have

been associated with manifestations of myocardial infarction. Incidentally, it is well to emphasize that after recovery from heat stroke there are no long term ill effects and recurrence is not made more likely.

Proper Teaching of Skills

This subject, of course, falls within the domain of the coach but medical advice is often sought. It should again be pointed out that motor skills, agility, coordination and strength are variable and should be carefully considered in placing an adolescent in the type of sport best suited to him. It should be emphasized that with adolescents chronological age is a poor criterion for evaluating and planning. Of much more value is their state of growth and development (epiphyseal age [judged, for instance, from x-ray films of the wrist and hand]) and secondary sexual characteristics (maturation rating). A good coach can command respect and admiration from hero-worshipping teenagers and serve as an inspiration to them. On the other hand, I am reminded of the story of the football coach who, while giving a pre-game pep talk to his team, said "remember that football develops individuality, initiative and leadership. Now get in there and do exactly as I tell you."

Properly-Fitted, Well-Constructed and Adequately Maintained Equipment

Good equipment is essential if injuries are to be minimized. It has been shown by Robey of North Carolina that football players with suspension type football helmets have a lower injury rate than those with padded helmets. It also was shown that the Rawings CP, UP₂ and HPO shoulder pads were superior to all other types and makes in prevention of injury to the shoulder girdle area. From a three year statewide study by the New York Public High School Athletic Association, it was concluded that two equipment combinations—a low shoe, disc heel, ankle wrap and low shoe, short cleats, no ankle support—produced a statistically significant lower rate of serious injuries of the lower extremities, particularly of the knee. It was recommended that varsity high school football players be outfitted with low shoes and some form of disc or flat heel or short cleats and that the sole cleats on football shoes be shortened as soon as possible. Helmets for soccer goalies (to prevent head injuries when on the ground); better helmets for baseball players; protective headgear, shatterproof glasses and properly fitting mouth

pieces for hockey players have all helped reduce the incidence of athletic injuries. This reduction can best be accomplished by giving sufficient attention to their prevention. Thus the search for better equipment (for instance, modification in collar design to offer better protection against football flexion injuries) continues constantly as one means to this end.

Proper Facilities for Competition

Adequate sports facilities are a vital part of any program which seeks to minimize morbidity in sports. The type of turf and its proper maintenance for football, adequate space for basketball courts, elimination of unnecessary hazards alongside fields and courts, proper locker room facilities and showers are all factors that can reduce the extent of injury and illness.

The Application of Sound Health Principles

The importance of sound principles in the care of equipment, locker rooms, showers and the like is quite obvious. Thorough cleanliness, frequent washing of playing apparel and proper attention to foot gear will help prevent many of the small debilitating conditions such as blisters, fungus and other skin diseases.

Competent Officiating Under the Rules Code

It has been estimated that approximately 10 percent of all football game injuries in high school occur as a result of violations of the rules. Thus constant attention should be paid to upgrading the understanding and skills of all officials who have a major responsibility for the safety of play. Furthermore, rule codes can be and are being constantly improved for the safety and protection of the participants. A survey of New York state high schools has shown that changes can be initiated that result in greatly diminished morbidity (for instance, eliminating spearing and revising blocking rules to exclude check-back and blind side blocking).

First Aid Instruction for the Prevention and Treatment of Injuries

Instruction in first aid should be an integral part of any sports program. Every contact sport needs a physician sitting on the bench or, at least, readily available. Every trainer and coach should be familiar with the most common types of injuries (which in adolescents are sprains, muscle contusions, strains and joint contusions). Different sports

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are most commonly associated with particular injuries. Football is associated with sprains and contusions, concussions, neck injuries, knee and lower extremity injuries, contused viscera, shoulder dislocations and fractures. Basketball is associated with strains and sprains; internal derangement of knee joints and fractures of wrists, feet and ankles. In baseball, hand, elbow and shoulder problems (epiphysitis and osteochondritis) are seen, as well as fractures of the lower extremities. Soccer is associated with comminuted tibial fractures and track with fatigue and avulsion fractures.

There is no proper place in sports for the use of local anesthetics to eliminate pain so that a player can continue in the game. If they are used, an injury may be made worse and the injured athlete's future athletic activity endangered. The local injection of steroids into acutely injured soft parts may result in delayed healing of the tissues by virtue of the catabolic effects of the drug. There is also very little objective evidence from controlled studies that the injection of hyaluronidase, an enzyme that has been used in the treatment of selected athletic injuries for several decades, is of any value in speeding wound healing and repair. Prolonged breathing of oxygen before exercise, as is sometimes done, is ineffectual as it is impossible for the body to store it, and there is no evidence that breathing oxygen hastens recovery from fatigue or improves performance.

After a concussion a player should be removed and kept out of further participation in that game. Recovery from a mild concussion occurs within a few days but it would be well to recommend gradual resumption of activity and not allow full activity for about a week. With a more severe concussion, an athlete should not be allowed to play until all signs and symptoms have cleared. Two concussions should keep an athlete out for the season and three should remove him from contact sports. After a shoulder dislocation, an athlete should not return to play before six weeks—and then with a proper protective device.

When the diagnosis of injury to an important

organ or structure is in doubt, an adolescent should not be permitted to resume competition until all the signs and symptoms have cleared. Whenever there is the possibility that participation may aggravate even a minor injury, an athlete should temporarily be removed from competition. The physical standards for return to competition are (1) restoration of muscles to full strength when weakness has resulted from the injury, (2) recovery of function of a major joint as shown by a full range of painless motion and no instability and (3) clinical and x-ray evidence of solid union in a fractured bone. For the final decision, the athlete should be observed by physician and coach or trainer for his agility and facility of performance. An adolescent often is impatient to return to activity but his future welfare must not be jeopardized in an attempt to ensure victory. An inefficiently treated injury may result in a subsequent deprivation of those opportunities to gain acceptance and self-confidence which athletics offer.

The positive values of sports should be emphasized because of their social, psychological and emotional values. All possible safeguards should be taken to protect the health and welfare of participants. Adequate evaluation, supervision of playing areas to make them free of hazards, proper conditioning, good coaching, the best possible equipment and its judicious care, and adequate treatment and proper rehabilitation, will serve to reduce and minimize athletic injuries.

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